FACTS ABOUT TRACTOR FUELS

THE BURNING QUESTION

THIS booklet is written to answer questions tractor owners and operators may wish to ask about fuels. It is intended to present technical facts fairly and accurately, yet simply and briefly. It points out the limitations of different fuels in different types of tractors as indicated by (1) *engine performance*, (2) *the price of the fuel, and* (3) *working conditions.*

Because Case tractors are built to burn many fuels, Case has no reason to favor one fuel more than another. Long experience, beginning with the first gas tractor of record, built by Case in 1892, enables Case to speak with authority on the subject of fuels. The technical facts have been verified by engineers of the petroleum industry. A previous edition of this book has been distributed widely by oil companies and used by their employees. No matter what kind of tractor you may have or may consider owning, you should know the facts in the following pages—

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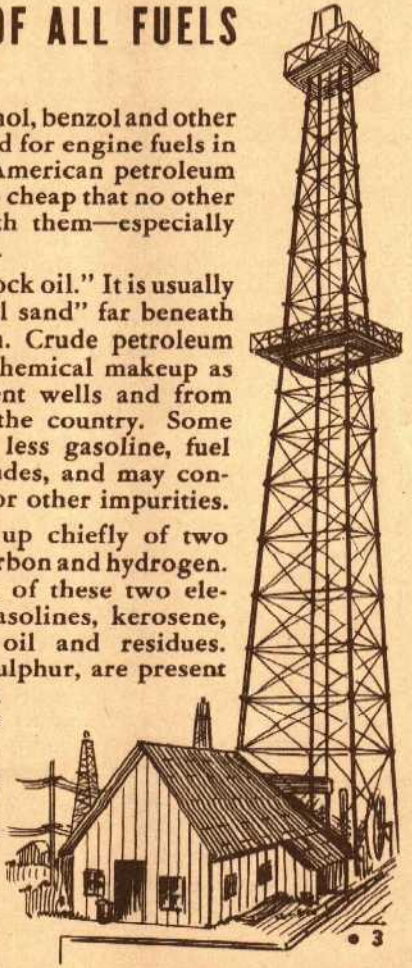
PETROLEUM

THE SOURCE OF ALL FUELS

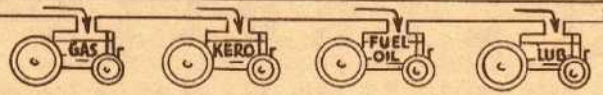
ALTHOUGH alcohol, benzol and other materials are used for engine fuels in some foreign lands, American petroleum and its products are so cheap that no other fuel can compete with them—especially for farm tractor work.

Petroleum means "rock oil." It is usually found in layers of "oil sand" far beneath the crust of the earth. Crude petroleum differs somewhat in chemical makeup as it comes from different wells and from different sections of the country. Some crudes yield more or less gasoline, fuel oil, etc. than other crudes, and may contain asphalt, sulphur or other impurities.

Crude oil is made up chiefly of two chemical elements—carbon and hydrogen. Various combinations of these two elements make up the gasolines, kerosene, fuel oil, lubricating oil and residues. Other elements, like sulphur, are present in the crude only in small amounts, and are classed as impurities. The different useful products of crude oil are secured by a process known as "refining."



FROM THE REFINERY



TO YOUR TRACTOR

OIL refining in its simplest form is a process of distillation. The first step in refining is to heat the crude. The vapors that come off at different heating temperatures are condensed by cooling. Gasoline boils easily so naturally is one of the first products of distillation. It is followed by kerosene, fuel oils and lubricating oils, as well as other parts or "fractions." The still, thus, is known as a "fractionating" still.

This simple sketch pictures the path of the crude oil from the well to the heating furnace, and thence into the still, from which the different "fractions" or products are obtained. Refining was originally a matter of simple distillation without attempting to change the chemical character of the products. More recently it has been discovered that certain desirable chemical changes can be brought about in refining.

REFINING BY CRACKING. By distilling at high temperatures with the charge under pressure modern refining is enabled to secure more gasoline and more fuel oils from the original crude than ever before. This process is known as "cracking." It produces not only more engine fuel from the original oil from the well, but actually better fuels. The best present day tractor fuels are "cracked" products.

JUDGING THE FUEL. Today, so many different tractor fuels under a variety of names are offered on the market, that only by actual performance in the tractor can their value be finally determined. A reasonably safe guide to follow in selecting a fuel before actual use in the tractor engine, is the list of specifications supplied by the oil distributor. These specifications include the following:

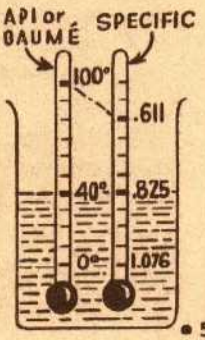
Boiling Points:

Initial ..... °F
10% at ..... °F
50% at ..... °F
90% at ..... °F
Maximum or "End" ..... °F

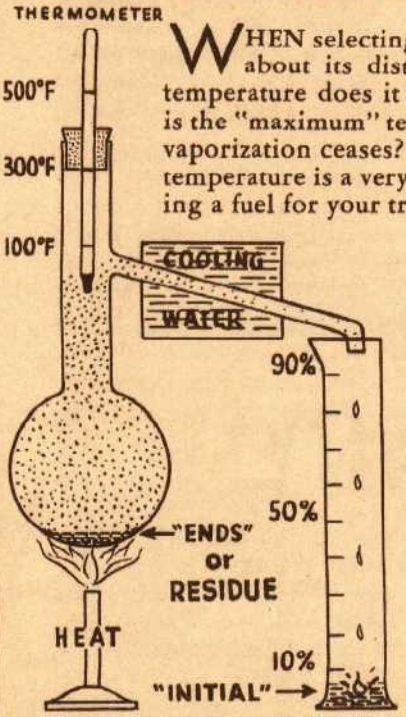
Residue ..... %
Gravity (API or Baume or Specific) .....
Octane No. .....
Sulphur ..... %
Flash and Fire Points ..... °F

GRAVITY?

Gravity measures the heaviness or density of a fuel. The measurement is taken by a float weighted at one end, and with a slender stem at the other which rises from the surface of the liquid. The stem is scaled according to standard methods. Three types of scales are used—API, Baumé and Specific. API and Baume use about the same scale and are read in "degrees" — the lighter the fuel the higher the reading. Specific gravity is a direct relationship between the weight of the fuel and the weight of an equal volume of distilled water—the lighter the fuel the lower the reading. Since fuels of the same gravity will vary materially in engine performance, gravity alone is not a reliable guide in judging a fuel.



DISTILLATION RANGE



WHEN selecting a fuel ask the distributor about its distillation range. At what temperature does it start boiling? And what is the "maximum" temperature reached before vaporization ceases? This range of distilling temperature is a very important factor in judging a fuel for your tractor.

Boiling points are measured in the laboratory by a simple "still" illustrated at the left. The fuel for the test is placed in a flask and heated. The vapor is cooled and condensed as it leaves the flask. The first temperature reading is made as the first drop of liquid falls into the receiving vessel. This is called the "Initial" boiling point. Temperature readings are continued as 10%, 20%, etc., of the fuel is distilled and continued to a point where distillation stops. This is called the "end" point or "maximum." The material remaining in the flask is called the "ends" or residue.

WATCH THE SPREAD. How uniformly the distillation temperatures rise between Initial and End Points is important because it indicates the uniformity of a fuel.

The "tractor fuel," charted on page 7, starts with an initial boiling point of 368° F. and distills 90% with a steady rise of only 75° temperature. This fuel would

"INITIAL" . . . "END" POINTS

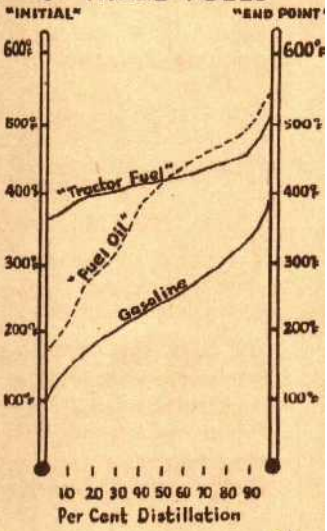
work well in a Case tractor with its heat control manifold and would probably out-perform the "fuel oil" with its wide temperature range and higher "end" point.

Gasoline should have a low Initial—100° F. or under—to assure easy starting of a cold engine. However, too much of the gasoline should not distill near the initial boiling point, because as the engine warms up actual boiling or "vapor lock" might occur in the carburetor, or fuel piping, causing the engine to "misfire" or stop.

WATCH THE "END POINTS." Since the End Point tells us the greatest amount of heat required to completely vaporize a fuel, it may be used as a further guide to judge its adaptability to the tractor engine. End Point temperatures above a certain range require more pre-heating by the tractor engine than is practicable. A safe End Point limit for a Case engine is 500° to 525° F. This limit will include the more dependable tractor fuels (fuel oils, furnace oils, distillates). Fuels of higher End Points may be satisfactory if 75% or more of distillation occurs under 500° F.

REDUCE THE RESIDUES. The residue from a good "tractor fuel" under test will usually not exceed 1 or 2% of the original sample. Properly heated, it will burn in the engine and it has lubricating value, but in the case of poor fuels may contain excess amounts of free carbon, asphalt, or gums.

DISTILLATION CURVES OF THREE FUELS

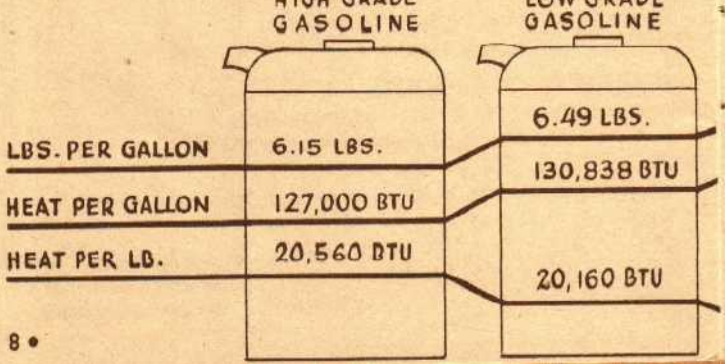


IT'S THE HEAT

FUEL is useful mostly for the heat it contains, whether used actually for heating or converted into power for driving a tractor. It's the heat given off when the fuel burns that determines its heating and power value. Heat causes the burning gases in the combustion chamber of an engine to expand. Thus the piston is forced downward to turn the crankshaft and the belt pulley or drive wheels.

HOW HEAT IS MEASURED. For convenience and comparison the amount of heat in a fuel is expressed in BTU's (British Thermal Units). A BTU is the amount of heat required to warm a pound of water one degree in temperature (Fahrenheit).

Heat is often expressed in B.T.U.'s per pound of fuel. Gasoline has slightly more heat units per pound than lower cost fuels. But the lower cost fuels—furnace oils, distillates, and "tractor fuels" weigh more—have *more pounds per gallon* which means they have more heat *per gallon* than gasoline.

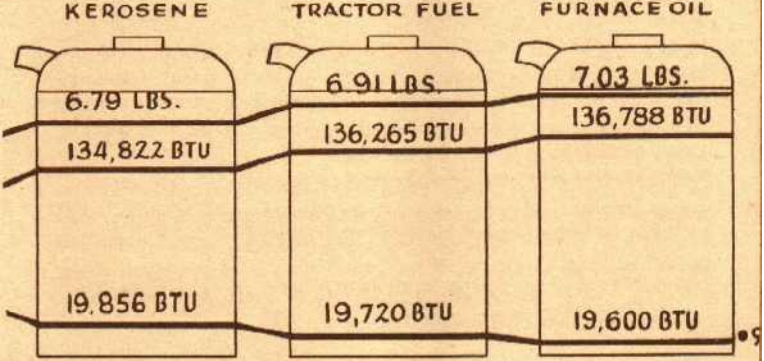


IN THE FUEL THAT COUNTS

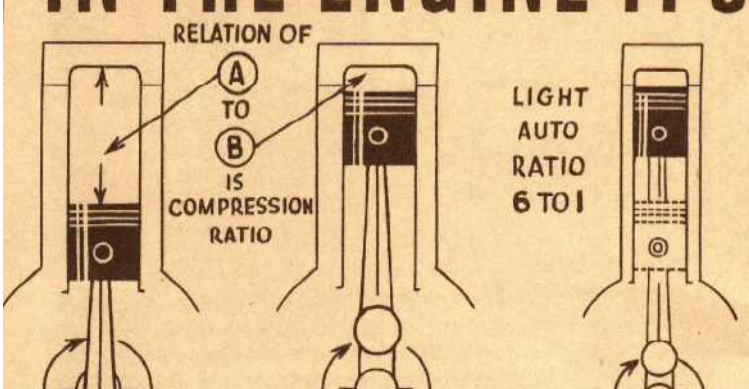
YOU BUY FUEL BY THE GALLON. Tractor test data which give fuel consumption in pounds per horse power are likely to be misleading. If a tractor, to pull a certain load, required the same number of pounds of either low cost fuel or gasoline, this would mean fewer gallons of low cost fuel—fewer gallons to buy and bought at a lower price.

MORE WEIGHT — MORE HEAT AND POWER. Whether or not the extra heat in a heavy fuel, like furnace oil, can be converted into power depends upon the design and construction of the engine. Case tractors are especially built to burn economically the low cost fuels as well as premium fuels—furnace oils to gasoline. Many Case users have switched to low priced fuel oils (now commonly called "tractor fuels") and obtained more horse power hours per gallon than from gasoline.

BE SURE TO BUY YOUR FUEL . . .
FROM A RELIABLE DISTRIBUTOR



IN THE ENGINE IT'S



FUEL is mixed with air in the carburetor to form an explosive mixture. This mixture is sucked into the cylinders by the pistons. The piston then returns and "compresses" the mixture before firing. The power or driving force delivered is effected by the mixture's explosive qualities and by the degree of compression.

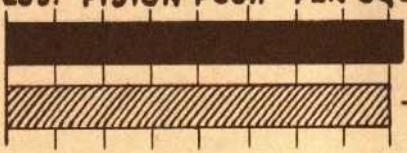
"Compression ratio" is a comparison or ratio of the complete cylinder volume when the piston is at its lower dead center (Fig. A above); with the volume of the cylinder when the piston is at upper dead center. (Fig. B, above.) "Compression pressure" is the highest pressure reached without ignition. It is measured by a gauge in the spark plug hole which gives the pounds pressure per square inch of piston area.

COMPRESSION HAS LIMITS. Excessive compression causes more wear and tear on the pistons, valves and bearings. Piston leakage which results in serious power losses is more likely to occur. Only high priced, high octane, fuels can be burned because ordinary fuels will "ping," or "knock" and waste power.

PISTON PUSH THAT COUNTS

The desirable degree of compression depends on the size of the engine's cylinder, design and degree of cooling. Tractor engines with larger cylinders, slower speeds and less heat loss operate efficiently at lower compressions than light, high speed auto engines with small cylinders and a high heat loss. Case engines, with properly designed combustion chambers and efficient cooling and manifolding, get power from the fuel at moderately high compression yet escape the penalties of excessive pressures.

IT'S PISTON PUSH THAT COUNTS. The really important factor in engine power is the average or "mean" effective pressure (MEP) exerted on the piston during the working stroke. Some fuels combined with very high compression give only a strong pressure at the beginning of the stroke, in which case the MEP may be less than in another engine which starts with lower pressures but maintains them longer. Mean effective pressure can be calculated by having the engine drive a belt pulley or electric generator hooked up with a set of scales which measure the pounds pull. From this is calculated the "Brake Mean Effective Pressure" (BMEP) which practically means effective "piston push." A Case tractor tested on kerosene, the poorest of standard tractor fuels, actually exceeded in BMEP, or "piston push," sixteen other tractors on gasoline.

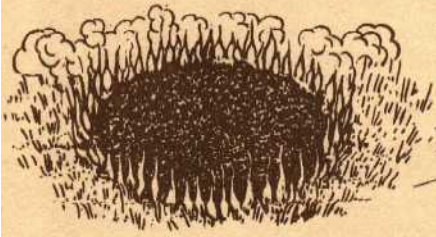


CHOOSE A FUEL

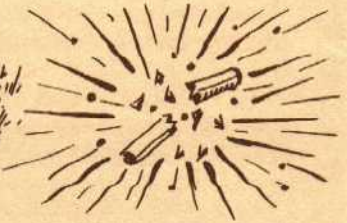
GOOD power from a tractor engine requires that the fuel burn steadily from the time of the ignition spark until the piston's power stroke is well advanced. Its combustion should be similar to that of a grass fire which starts with a wisp of flame at the point of lighting and spreads steadily into a widening circle of flame. For correct burning in a tractor engine, the flame starts at the spark plug and spreads steadily as a wall of fire with the unburned mixture in front and burned gases behind. The heat produced by the burning causes the gases to expand and force the piston downward. This "grass fire" type of explosion is brought about by engine design and the type of fuel used. It has much to do with the ability of Case engines to hang on to full loads at slow engine speeds. It reduces the fuel required per horsepower hours delivered.

GRASS FIRE OR DYNAMITE COMBUSTION. Contrast the "grass fire" type of explosion with that of dynamite. Dynamite explodes by "detonation"—a quick powerful blast and all is over. The word "detonation" is used for a poor kind of combustion in engines, because it closely resembles the explosion of dynamite.

Put enough pressure on it in the presence of air and

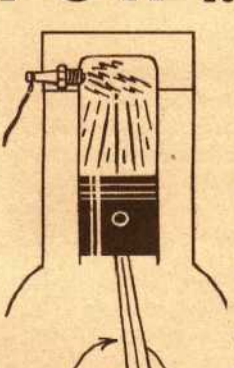


12 • SPREADING GRASS FIRE



DYNAMITE EXPLOSION

FOR STEADY FLEXIBLE LOW COST POWER



any tractor fuel will explode without a spark. But instead of burning by spread of flame and thus exerting a more steady pressure, the entire charge "lets go" at once, like dynamite. Pressures may jump four times those of normal combustion, but they fall away immediately.

In very high compression engines, some fuels will explode before the spark ignites them, or very rapidly (detonate) after ignition, causing "pinging" or "spark knock," excessive heating of the engine, and a great waste of power. Economical performance of these engines is limited to the use of premium fuels with a high anti-knock or "octane" rating (see page 14). Diesel engines, although very high compression engines, operate on refined fuel oils, because the fuel is not injected into the combustion chamber until the air is compressed and the piston begins its power stroke. There is no electric spark. Pressure and the heat generated cause the fuel to burn.

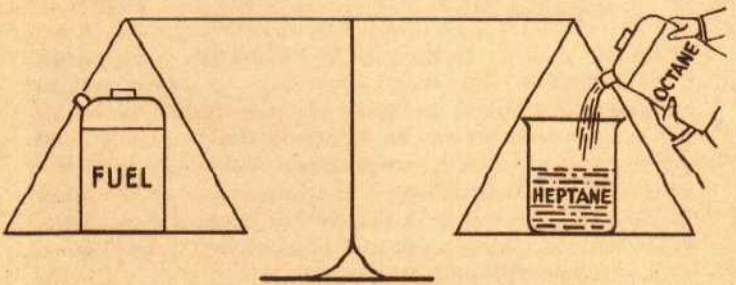
STEADY, LOW COST CASE POWER. "Pinging," "spark knock," or pre-ignition depend partly on the character of the fuel and partly on the design of the engine. Case engines are so carefully designed that even with a relatively high compression ratio they burn low cost fuels successfully and economically. At the same time the compression is sufficiently high and the manifold construction is such that efficient burning of gasoline is successfully accomplished.

"OCTANE" GIVES

THE HIGH compression ratios of present day automotive and airplane engines have been made possible only with the parallel production of high anti-knock fuels. The measurement of a fuel's ability to burn properly under high compression without "knocking" is referred to as its "octane" rating.

OCTANE GIVES "KNOCK RATING." Two engines of the same compression ratio may perform differently on the same fuel. That's because other construction characteristics besides compression affect fuel performance. Since it is not practical to judge the "anti-knock" of a fuel entirely by the compression ratio it will stand, the "octane" rating has been established.

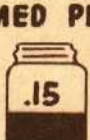
To measure octane rating a fuel is run in a test engine of specific design, and with changeable compression. Then a mixture of Heptane and Iso-octane is burned in the same engine. Heptane knocks with very little compression, octane knocks only at extremely high compression. The percentage of octane in the mixture required to balance the performance of the fuel under test is the "octane number."



"KNOCK" RATING

GAL. FUEL CONSUMED PER HORSEPOWER HOUR

CASE MOTOR-LIFT ON KERO.



11 OTHERS ON KERO.

20 OTHERS ON GAS

CRACKING RAISES OCTANE VALUES. Judging the anti-knock of a fuel by low boiling points or gravity alone is likely to be misleading. High octane fuels often come from crude oil containing the heavier fuels. Similar products from the same crude have a higher anti-knock value when refined by "cracking."

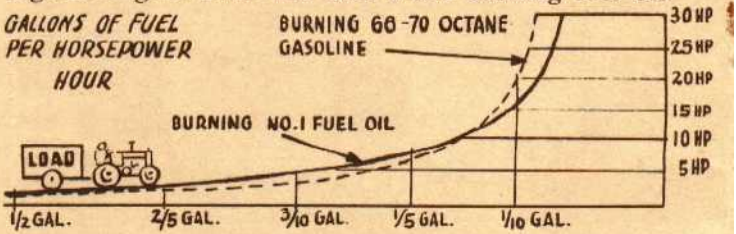
The better grades of fuel oils and tractor fuels are now "cracked" products. They have an octane rating of 30 or more and will give dependable low cost performance in Case tractors. Octane values in gasoline are sometimes stepped up by adding chemicals, notably lead or by blending with other fuels.

While octane value does not affect the amount of heat in a fuel, it does help the engine convert more of the fuel's heat into useful power. Case engines, even with their moderately high compression ratios, get the power from low octane fuels, and still burn the high octane fuels economically.

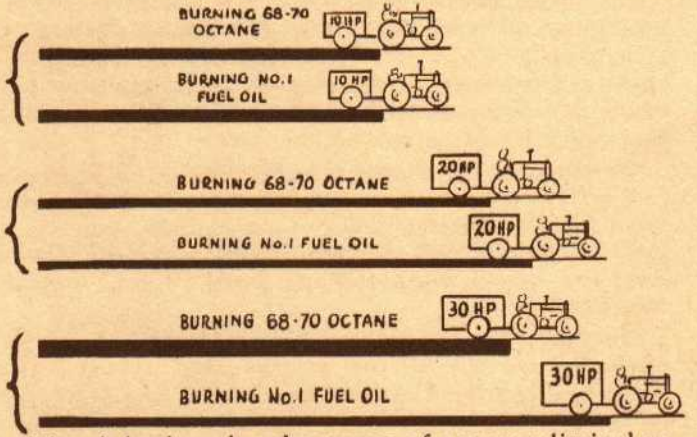
Most official tests on Case tractors have been made on kerosene—not the best tractor fuel, present kerosenes having practically no octane value. As indicated by the illustration above, a current model Case tractor consumed 14% less kerosene than the average of eleven other tractors on the same fuel, and 16% less kerosene than the average of twenty other tractors on gasoline.

WHAT ONE TRACTOR

A CERTAIN tractor (not a Case) was officially tested on two different fuels. For burning gasoline (68-70 octane) a high compression engine head was used. The regular engine head was used when burning fuel oil.



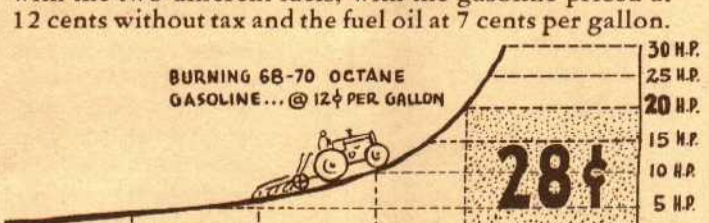
Note from the chart above that at half load and higher (15 H. P. or more), close to 20% more gasoline was used than fuel oil. This data is expressed below in distance traveled on equal quantities of the two fuels.



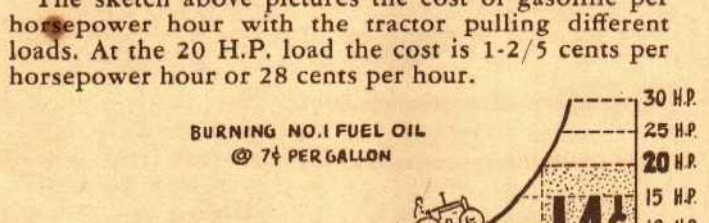
Thus it is clear that the owner of a tractor limited to gasoline for fuel may be placed at a distinct disadvantage in the amount of fuel used. But the amount of the two different fuels consumed is only half the story. After all,

DID ON TWO FUELS

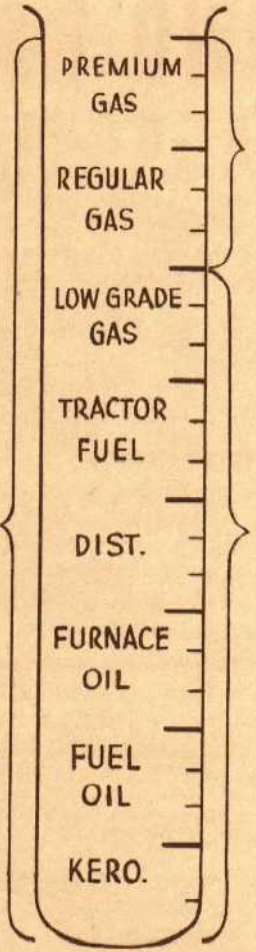
it's costs that count. So let us consider the work of this tractor in terms of cents per hour, pulling the same load with the two different fuels, with the gasoline priced at 12 cents without tax and the fuel oil at 7 cents per gallon.



The sketch above pictures the cost of gasoline per horsepower hour with the tractor pulling different loads. At the 20 H.P. load the cost is 1-2/5 cents per horsepower hour or 28 cents per hour.



Pulling the 20 H.P. load on fuel oil, as graphed above, the cost is 7/10 cents per horsepower hour or only 14 cents per hour. The performance of this tractor on the two fuels indicate that (1) low cost fuels may deliver more power per gallon and certainly more power per dollar depending on the difference in price of the fuels, and (2) that a tractor limited to one particular kind of fuel may be seriously handicapped in operating economy.



CHOOSE

SOME TRACTORS BURN ONLY THESE FUELS

Some tractors are limited to gasoline only. Gasoline usually costs more per gallon than other fuels, and may do less work per fuel dollar than other fuels. See pages 16 and 17.

SOME TRACTORS BURN ONLY THESE EFFICIENTLY

One group of tractors perform well on the heavier fuels, but do not pull loads efficiently on gasoline —a serious handicap when gasoline is low priced and for frequent stopping and starting of the tractor.

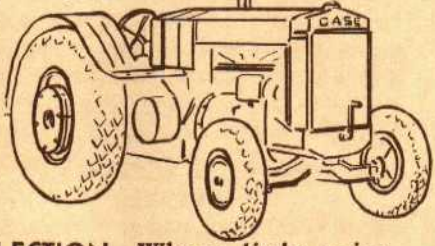
DIESEL TRACTORS ARE LIMITED TO SPECIAL DIESEL FUELS. FUEL COSTS MAY BE LOW BUT TOTAL POWER COSTS ARE HIGH.

* Case burns both gasoline and the heavier tractor fuels which are supplied by different oil companies under a variety of names—distillate, furnace oil, fuel oil, tractor fuel, etc., although they may be of similar quality. Heavy fuels of good grade will conform quite closely to the specifications of good tractor fuel given on page 24.

A CASE AND BURN YOUR KIND OF FUEL

BY being able to burn a wide range of fuels successfully, Case owners enjoy advantages in choice of fuels according to performance, price, availability and working conditions.

CASE "L" TRACTOR

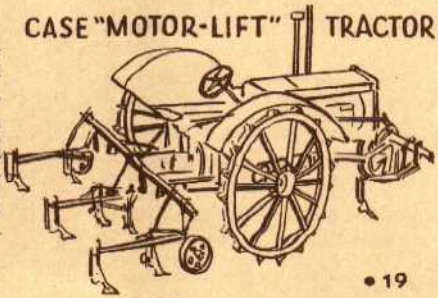


PERFORMANCE SELECTION. Where little price difference exists between good grade gasoline and lower grade fuel, it might be best to use the gasoline, although (see pages 16 and 17) with a good load and under constant working conditions more work per gallon will usually be secured from a good grade of furnace oil or tractor fuel.

PRICE SELECTION. In many sections gasoline is several cents higher per gallon than other fuels. In some states there is no tax refund for gasoline purchased for tractor use. Under these conditions the Case tractor owner can always resort to other fuels available.

CONDITIONS SELECTION. In cold weather, for a cold engine, and for odd jobs requiring repeated stopping and starting the Case user can burn an appropriate fuel—gasoline.

CASE "MOTOR-LIFT" TRACTOR



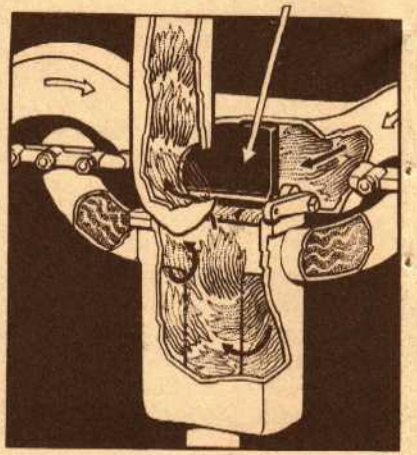
SQUEEZING POWER

ALTHOUGH Case tractors are highly efficient in getting power from the fuel, complete combustion is virtually impossible in any engine cylinder, because of the cooling effect of the metal. Combustion approaches perfection, depending on the correct proportion of fuel and air, the "break-up" or mistiness of the mixture, the amount of vapor, and numerous details of engine design.

HEATING LOW COST FUELS. A certain amount of vaporized fuel is required in the fuel mixture to start firing and produce proper burning of the mixture. High grade fuels with low "initial" boiling points vaporize sufficiently without pre-heating. Low cost fuels such as kerosene, tractor fuels and furnace oils require heating to produce the required proportion of vapor.

CASE HEAT-CONTROL HEATS FUEL. Look at this sectional drawing of a Case heat-control manifold set for heavy fuel. Studies with glass manifolds show that fuels have quite a tendency to "crawl" up the pipe just above the carburetor, also to collect in a little puddle at each side where the passage branches like a "T." Case concentrates the heat at exactly these

DAMPER SET FOR HEAVIER FUELS



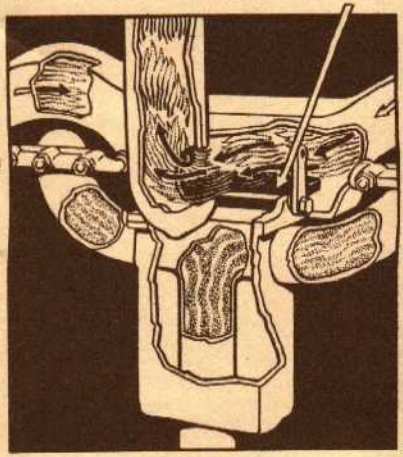
from THE "LAST DROP"

points, catching most of the fuel, but heating the air as little as possible. The heat, of course, vaporizes only the "initial" part of the fuel, but the remainder being hot mixes more readily with the air to form the mixture required for efficient burning in the combustion chamber.

BURNING THE "LAST DROP." By the last drop is meant the burnable portion of the heavy "ends" or residue. These "ends" will not vaporize in a distillation test, but if properly heated and mixed with air along with the lighter parts of the fuel, they will burn and provide power in an engine. Case engines are conveniently adjustable to properly heat and blend the heavy "ends" into useful power.

In heavy fuels of good quality, the small amounts of unburnable ends or residue have lubricating value. They serve to oil the valves and upper cylinder walls and are beneficial to the tractor engine.

DAMPER SET FOR LIGHTER FUELS



The Case heat device is damper-controlled to give the correct amount of heat required to properly vaporize and mix the fuel with air for an efficient burning mixture. For starting fuels, and fuels that do not require heating, the damper can be set to divert the exhaust gases directly to the exhaust pipe.

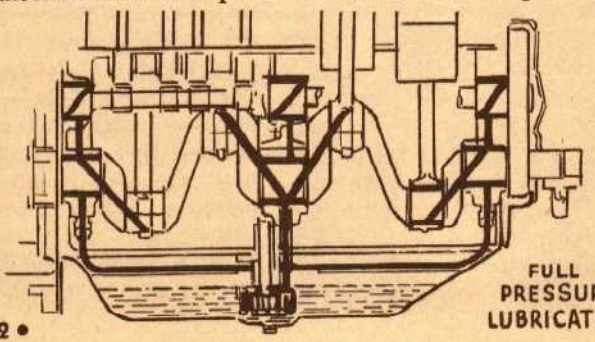
GAIN POWER *With*

ENGINE lubrication and fuels are so closely related to one another that this discussion would not be complete without some reference to lubrication. Progress toward perfection in both the tractor and automotive fields is pretty well indicated by the modern engine's ability to run with lighter crankcase oils.

BETTER LUBRICATION WITH LIGHT OIL. Light oil is more easily whirled into a fine spray for earlier and surer lubrication of the pistons and cylinders. It penetrates between close fitting parts, it reduces "oil drag" and thus helps the engine deliver more power.

Because of close fits and clearances throughout the engine, light oil is virtually required in Case tractors. It is pumped to all rod, main, and camshaft bearings under pressure, keeping them cool, assuring long life.

Because of heavy particles of dust that entered the cylinders and crankcase, early tractors required heavy lubricants. The thick film between the crudely fitted parts helped reduce the grinding effect of the dust. Hot spots and cold spots throughout the engine also required heavy oils. Now engine temperatures are more uniform. Drastic steps have been taken to keep out dust.



FULL PRESSURE LUBRICATION

LIGHT LUBRICANT

CASE NON-RESTRICTIVE AIR CLEANER. Case believes it is more important to keep out the dust than to attempt to purify the oil after the dust gets in. By the time dust gets past the valves and pistons into the crankcase it has done some damage.

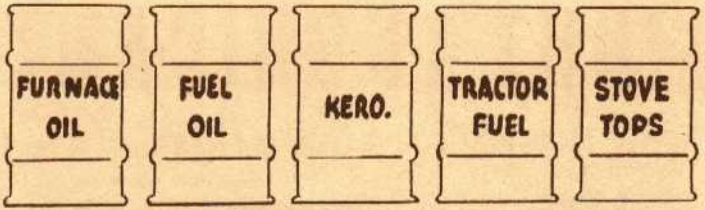
The Case-built air cleaner passes the air around sharp curves and across an oil pool, to remove the coarse dust, then up through a series of screens coated with oil film, to remove any remaining dust particles. This cleaner is non-restrictive. It does not "choke" the carburetor.

Rigid, gasket-sealed covers, heavy washers of felt and leather further keep the dust out, and the lubricant in.

OIL, FUEL AND DILUTION. Unburned fuel entering the crankcase dilutes the oil. Formerly this was thought to destroy its lubricating value. It is known now, however, that small amounts of dilution merely make the oil thinner. Dilution is more or less offset by evaporation of fuel from the oil, as it is whirled in the crankcase.

That Case tractor engines permit, in fact demand, light oil, is proof aplenty that Case has dilution completely under control. Case "last drop" combustion leaves little unburned fuel for dilution. Accurately fitted pistons in sleeve-type cylinders free of distortion further reduce the "blow-by" of gases into the crankcase.

Seeming failure of an engine to consume any oil is usually proof of poor lubrication. Dilution by unburned fuel or condensed water may be keeping up the oil level.



FUELS TO BURN

"INITIAL" "END"

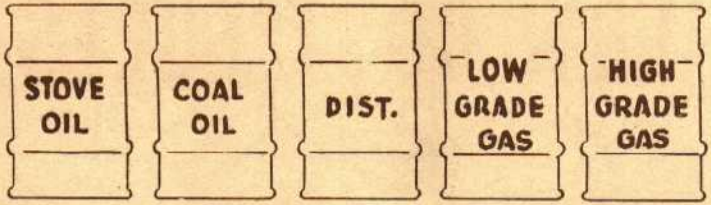
600°F
500°F
400°F
300°F
200°F
100°F

FUELS BELOW THIS LINE ADAPTED TO CASE TRACTORS

FURNACE OIL
FUEL OIL
KEROSENE
TRACTOR FUEL
STOVE TOPS
STOVE OIL
COAL OIL
DISTILLATES
LOW GRADE GAS
HIGH GRADE GAS

SPECIFICATIONS
For a Good
Low Cost
Tractor Fuel

Distillation Range:
Initial Boiling
Point .....358°F
10% at ...388°F
50% at ...425°F
90% at ...472°F
Max. or
"End" ....505°F
Residue.....Trace
Gravity
(Specific) .83
(API or Baumé) 39°
Octane
Number.....30
Sulphur .0015
Flash Point ..155°F



IN CASE TRACTORS

NOW that we have a better understanding of fuels and their use as a source of tractor power, what fuels are best for Case tractors? While performance in the tractor is always the final test, a reasonably safe guide to follow in selecting a fuel is the list of specifications found in Case Instruction Manuals for low cost fuels—(see also opposite page)—compared with similar specifications as supplied by all reliable oil companies.

A WORD ABOUT DISTILLATES. A wide variety of fuels are called "distillates" from low grade gasoline to fuels with high "end" distillation points. The only real way to judge the probable performance of a fuel called "distillate" is by its specifications as given by the oil company. Case tractors burn a broad range of good distillates with splendid results.

MEANING OF FLASH AND FIRE POINTS. "Flash" is the lowest temperature required to produce explosive vapors from fuel. "Fire" is the lowest temperature to produce vapors that will burn continuously. "Flash" and "fire" indicate the volatility and inflammability of a fuel. They also suggest the starting quality of a fuel in a cold engine.

FUEL LIMITATIONS FOR CASE TRACTORS. See diagram on opposite page for fuels most commonly burned by Case users. See also the table of specifications for good low cost tractor fuel. Read again page 7.

LOW COST FUELS

CAREFUL investigation shows that repair and service costs for Case tractors burning low cost fuels is no more, in many instances even less, than for Case tractors burning gasoline exclusively.

USERS SUPPLY FACTS. Owners of 208 Case tractors (4 to 8 years old) throughout the United States and Canada have obligingly supplied data on upkeep costs. All the tractors have been operated 4 to 8 years, actually running for a total of 888,754 hours. Half of them (104) used gasoline exclusively—the other half (104) used various low cost fuels from furnace oils to kerosene.

The tractors burning gasoline were operated a total of 441,159 running hours, or 710 running hours each per year. Their average yearly repair cost was $8.48, or approximately 1-1/5 cents per running hour.

1-1/5 CENTS PER HOUR ON GASOLINE. Of the 104 gasoline users—

19% listed repair costs under $1.00
31% listed repair costs from $1.00 to $5.00
21% listed repair costs from $5.00 to $10.00
29% listed repair costs over $10.00

LOW COST UPKEEP

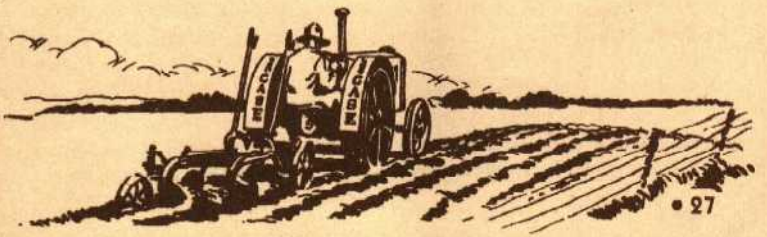
ONLY 1 CENT PER HOUR ON LOW COST FUELS
—In contrast with the gasoline users of the 104 low cost fuel users—

14% listed repair costs under $1.00
43% listed repair costs from $1.00 to $5.00
21% listed repair costs from $5.00 to $10.00
21% listed repair costs over $10.00

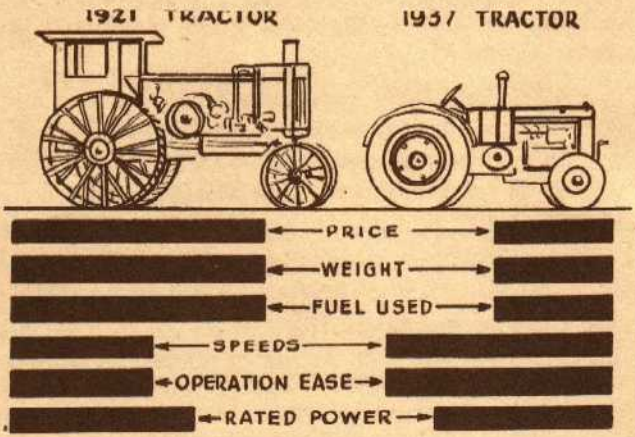
These tractors had operated 447,595 running hours, or 706 running hours each per year. The average yearly repair cost was $6.98—approximately 1 cent per hour.

LOW UPKEEP ON ANY FUEL. This direct investigation, combined with statements of thousands of other Case users, very definitely shows that Case tractors burning low cost fuels require no more upkeep expense than gasoline burning tractors. Case user experience further shows that Case upkeep costs are surprisingly low on any fuel.

MAKE SURE YOUR FUEL IS CLEAN. PUT A SAMPLE IN A BOTTLE AND WATCH FOR SETTLINGS. A FEW DROPS ON WHITE BLOTTING PAPER WILL REVEAL SEDIMENT.



LOW FIRST COST



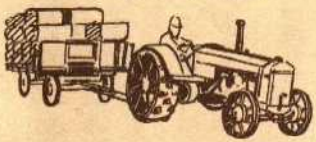
CASE tractors cost about half as much to buy, weigh half as much, and cost half as much to operate as tractors of 15 or more years ago of the same power rating. In addition, modern Case tractors travel many times faster, and are much easier to operate.

FIRST COST LESS THAN WORK ANIMALS. Costing approximately $50.00 per drawbar horsepower—one-fourth the price of a good horse or mule—Case tractors will do the work of a whole flock of work animals. "It would take at least 20 horses to do the work of my Case 'motor lift'," writes Victor Burr, Juniata, Nebraska. And, "The work performed by my six Case tractors could not be done by 100 mules," declares another user from the South.

Thus Case tractors as compared with other kinds of power, are recognized by experienced tractor owners as exceptionally low cost power from the time of purchase.

HIGH RESALE VALUE

THE LIFE AND WORKS OF *Lulu Belle*



BACK in 1929 Mr. W. H. Mullin, Manager of Better Farms, Inc., Fond du Lac, Wis., purchased a new Model "L" Case tractor. This tractor's performance was so outstanding from the start that mechanic Art Schaefer and various operators christened it "Lulu Belle" to express their high esteem.

"Lulu Belle" started work on a large thresher and was run almost continuously throughout the summer, fall and winter—threshing, corn cutting, brush and marsh plowing, feed grinding, hauling, harvesting, and haying.

After five years' continuous work, Manager Mullins thought "Lulu Belle" had served her time and traded her in on a new Case Model "L" on rubber. One day he chanced to visit the shop where "Lulu Belle" was being checked over.

"So here's old 'Lulu Belle'!" he cried. "How does she appear inside?" "Have a look for yourself, Mr. Mullins," suggested the dealer. "No wear at all in the transmission. A few parts will make her as good as new—She'll resell for about eight hundred dollars."

Mullins turned to the dealer, "Alright, I'll give you $800.00! Send 'Lulu Belle' back to us as soon as you can!"

So "Lulu Belle" went back to Better Farms. For over seven years she has served her owners faithfully and well. Now she is accompanied by two other Case tractors and other Case machines.

This true story is one of the many graphic examples of the high resale value of Case tractors.

LOW FIRST COST

LOWER FUEL COST

LOWEST UPKEEP COST

LOWEST TOTAL

831 CASE USERS CITE LOW POWER COSTS

FROM several hundred questionnaires forwarded to Case users throughout the United States and Canada, 831 returned to date have given very convincing data on low cost Case performance.

12c TO 19c PER HOUR—CULTIVATING. The Case "Motor Lift" Tractor averaged 12 cents per hour cultivating on low cost fuels—19 cents on gasoline. Ownership costs (depreciation upkeep, etc.) averaged about 15 cents per hour for all 2-plow tractors. Wm. Barnhart, Corpus Christi, Texas, cultivates with a 4-row "Motor Lift" for slightly over 2 cents an acre for fuel.

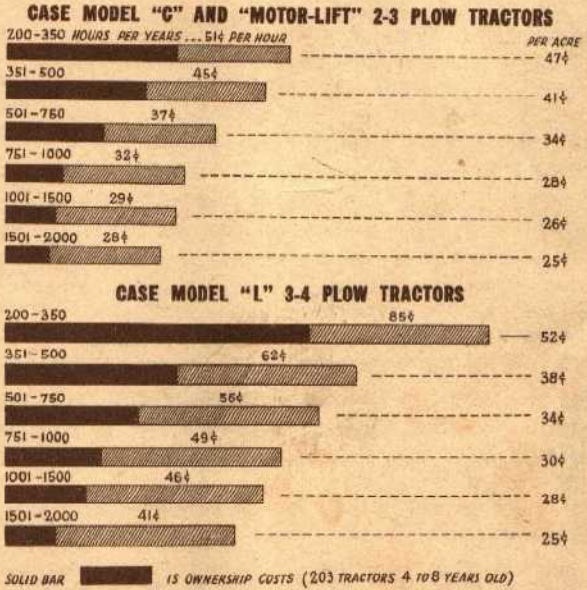
17c TO 22c PER HOUR—PLOWING. Plowing is naturally a heavier load and requires more fuel per hour and per acre than cultivating. Case 2-3 plow tractor operating costs for plowing, ranged from 17 cents on low grade fuels to 22 cents per hour on gasoline. Olaf Nelson, Merced, Calif., with a Case Orchard Tractor plows an acre for less than 7 cents for fuel.

1,686,000 HRS. OF TRACTOR EXPERIENCE. The direct evidence provided by these users combined with that of hundreds of others is final proof that a Case tractor offers *Lowest Total Power Cost.* Ask your neighbor about Case performance. For further details see your Case dealer.

POWER COST

PLOWING FOR AS LOW AS 25c AN ACRE

Plowing costs from 25c to 52c per acre are revealed by records of 561 Case owners. These costs include depreciation, repairs, grease, oil, and fuel. The graph below shows how total costs per hour vary with hours used per year.



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